

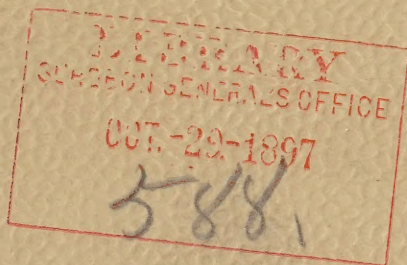
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*Pneumococcus-Abscess of the Ovary, with
Report of Three Cases.*

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By J. H. ETHERIDGE, M.D.,

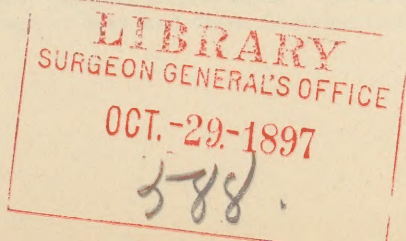
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SEVERAL different bacteria produce pus. They are called "pyogenic" or "pus organisms." The chief ones are the *staphylococcus aureus*, the *streptococcus pyogenes*, the *bacillus pyocyaneus*, the *bacillus pyogenes fetidus*, the *bacillus coli communis*, the *bacillus tuberculosis*, the *bacillus proteus*, the *staphylococcus epidermidis albus*, the *micrococcus lanceolatus*, or the *diplococcus pneumoniae*. The most characteristic purulent inflammations are produced by the *staphylococcus* and the *streptococcus*. The *staphylococcus* is much more likely to produce circumscribed purulent inflammations or abscesses. The majority of abscesses of the ovary are the work of the *staphylococcus*. A few ovarian abscesses contain the colon-bacillus. A few other pyogenic bacteria have been found in purulent collections in ovarian structures.

Up to date I can find no reported cases of ovarian abscesses produced by the *micrococcus lanceolatus*. It is my rare privilege to report three cases of this affection. The files of the *Index Medicus* fail to reveal a single reported case.

The *micrococcus lanceolatus* bears many synonyms, such as *diplococcus pneumoniae*, *micrococcus of sputum septicemia*, *pneumococcus of Fränkel and Weickselbaum*, *streptococcus lanceolatus Pasteuri*, *diplococcus lanceolatus*, *meningococcus*, *micrococcus pneumoniae cruposaë*, *micrococcus Pasteuri*, *bacillus septicus sputigenus vel salivarius*.

This organism was first discovered in 1880 by Dr. Sternberg, the Surgeon-General of the United States Army, in his saliva. The bacteriological world unites in according its discovery to this gentleman. With characteristic modesty he names it the "*Micrococcus Pasteuri*," ignoring himself utterly. The writer thinks it should bear the name "*Micrococcus Sternbergi*." The *micrococcus lanceolatus* ranks as the third most frequent cause of human inflammations after the pyogenic staphylococci and streptococci.



Something of interest can be said of this coccus, especially as to where it may be found and as to what it may do. It is found upon free surfaces, like mucous membranes, and in the body, as the blood and solid organs. It is found in the cellular tissue of the neck, in the mediastinum, and even in the conjunctiva. Occasionally it is found in the blood and in the juice of the spleen. It is said to pass into the fœtus in pregnant women. (Viti.)

The range of inflammatory processes produced is surprisingly large. In 1886 it was shown to be the sole specific cause of lobar pneumonia by Fraenkel and Weickselbaum. This coccus is found in the exudations in the cavum tympani and ethmoidal labyrinth. It is one of the causes of osteomyelitis and periostitis. It can cause acute ulcerative endocarditis. It is found in the buccal and naso-pharyngeal cavities of healthy persons. From these localities one can easily understand how it can invade the lungs and cerebral meninges. Foa and Bordoni regard it as the sole cause of cerebro-spinal meningitis. More recent researches, however, have modified this opinion somewhat, so that at present bacteriologists affirm that a small percentage of this malady is caused by other bacteria. It is a frequent cause of broncho-pneumonia. It can produce all kinds of inflammatory exudate—serous, sero-fibrinous, and purulent. It produces inflammations in any of the mucous and serous membranes. It may cause septicæmia. It is frequently the cause of arthritis. It produces abscesses in the parotid and thyroid glands, in the kidney, and in the liver. It is the most frequent cause of meta-pneumonic pleurisies, including empyema. (Welch.)

It may be mentioned as a curious bit of chemical information that Grimbert's experiments, recently prosecuted, show that this coccus determines fermentation in glucose, saccharose, lactose, maltose, raffinose, dextrin, galactose, arabinose, mannite, dulcitol, glycerin, and starch. The products of this fermentation vary according to the nature of the sugar employed, being ethyl alcohol, acetic acid, succinic acid, and lævorotatory lactic acid. (*Proc. Paris Acad. Sciences*, November 18, 1895.)

Serum-therapy from immunized animals, employed in pneumonia in human beings, has thus far proven negative. Rabbits may be made completely immune by repeated injections of diluted cultures of progressively increasing virulence, so that 30 c.c. of cultures of full virulence are borne without any striking disturbance. It is a curious fact that the serum from immunized rabbits can cure pneumococcus-infection in rabbits and mice. (Emmerich.)

Thus it is seen that this organism is of the highest importance. Its range of pathological manifestations is very large. To its already widely known fields of invasion in the human body is herewith added another one, hitherto unrecorded, so far as the writer's knowledge extends.

CASE I.—I am indebted to Dr. H. B. Stehman for the privilege of examining the pus in this case:

Mrs. C., aged twenty-eight years, never strong, never had pneumonia, married six years, sterile. Became acutely ill March 23, 1894, with great pain and tenderness in the right iliac fossa; fever and vomiting. Was crippled and ill from that date till her operation, August 21, 1894, during which period of time she had lost thirty-two pounds of flesh and experienced menstrual irregularities for the first time in her life.

Examination revealed an inextricable matting together of her pelvic organs. Nothing definite beyond this condition of affairs could be satisfactorily outlined.

The operation was performed August 21, 1894. Upon opening the abdomen the right ovary was found much enlarged and attached to the omentum, intestines, and uterus. In removing the ovary the abscess contained in it was ruptured, and about four drachms of pus escaped into the peritoneal cavity. This pus was subjected to careful bacteriological examination, and the only micro-organism found was the *micrococcus lanceolatus*.

Description of the specimen. The surrounding adhesions were uniformly distributed over the surface of the ovary, which was occupied by a mono-celled abscess about two inches in diameter. The pus that it contained was greenish-yellow, thick, and very tenacious. The pyogenic wall was lined with a ragged, thick, yellowish, fibrinous material. No communication existed between the abscess-cavity and the lumen of the Fallopian tube, which was adherent to the ovary.

Bacteriological examination. Cover-slip preparations from the pus, stained with aniline water solution of gentian-violet, showed very numerous lance-shaped cocci arranged in single pairs or short chains. Preparations treated by Welch's method (glacial acetic acid, stained with aniline water solution of gentian-violet, and washed with 4 per cent. solution of sodium chloride) showed the cocci to be surrounded by well-developed capsules. They were stained by Gram's method.

Cultures. On faintly alkaline glycerin agar-agar (5 per cent.) at 37° C., after twenty-four hours, cultures from the pus gave a pure culture consisting of a fine white growth. There was no growth at room-temperature. Cover-slip preparations from the pus showed cocci, distinctly lance-shaped, arranged in single pairs or short chains and staining by Gram's method. No capsules in the cultures. A rabbit was inoculated subcutaneously with one-half c.cm. of the pus from the abscess. It was sick for five or six days, and then improved. On the ninth day after inoculation it was killed, and a small abscess found in the abdominal wall at the point of the inoculation. Cover-slip preparations and cultures from the pus in the abscess gave results identical with those in connection with the ovarian abscess.

Sections of the ovary, hardened in alcohol, and stained by Gram's method, showed a few diplococci in the wall of the abscess. Sections stained with hæmatoxylin and eosin showed the wall of the abscess to consist of a dense fibrous external portion, the inner portion being densely packed with small round cells.

CASE II.—Mrs. M., aged twenty-five years, married seven years, had borne three children, of whom the youngest was eighteen months old. She had had two miscarriages, in May and November, 1894. She made a poor recovery from the miscarriage in May, and dates all of her trouble

from that time. Her chief complaint was pain in the left iliac region. She was never free from it until after laparotomy. Between May, 1894, and May, 1895, she says she had two abscesses break into the rectum. She gives no history of pulmonary disease in the past.

Examination, May 21, 1895, showed a perfectly ankylosed uterus with a small spot of fluctuation on the left side and excessive tenderness throughout the whole pelvis.

Operation, May 22, 1895. The pelvis contained numberless adhesions between the omentum, intestines, uterus, tubes, ovaries, and bladder. The right ovary was cystically degenerated, right salpingitis existed, and the left ovary, as large as a pullet's egg, and containing an abscess, was ruptured.

Description of specimen. Ruptured adhesions existed throughout the entire periphery of the ovary. The tube was firmly bound to the ovary. Its fimbriated extremity was patent, its lumen was not dilated, but its walls were slightly thickened. The folds of its mucous membrane appeared normal. The wall beyond the mucous membrane showed only a few areas of small-cell infiltration. Upon separating it from the ovary no communication between the abscess-cavity and its lumen was detectable. The ovary contained a single-celled abscess, one and one-sixteenth of an inch thick on one side, with a firm dense, outer coat, and one-fourth inch thick on the other side, with firm, dense tissue making up most of its thickness. The inner surface was covered with soft, fibrinous exudate, which, upon removal, revealed small hemorrhagic areas scattered throughout the inner layer of the wall.

Bacteriological examination. Cover-slip preparations from the pus stained with aniline water solution of gentian-violet showed very numerous lance-shaped cocci arranged in single pairs and short chains of from two to four pairs. Preparations treated by Welch's method demonstrated well-developed capsules about the cocci. They stained by Gram's method. No other bacteria could be found in the cover-slip preparations.

Cultures made from the pus immediately after the operation on faintly alkaline glycerin agar-agar (5 per cent.), after twenty-four hours at 37° C. gave a growth of fine white colonies. This proved to be a pure culture of lance-shaped cocci arranged in single pairs or short chains. They stained by the aniline water solution of gentian-violet, and were also stained by Gram's method. No capsules were present in the cultures. A rabbit was inoculated subcutaneously with one-half c.cm. of a twenty-four hours' old glycerin bouillon culture. It was sick for twenty-four hours, and recovered.

In sections of the abscess-wall hardened in alcohol and stained by Weigert's method abundant fibrin was seen on the inner side of the section, with a few diplococci scattered through it. Sections stained with hæmatoxylin and eosin showed the entire wall to be very vascular, the vessels throughout being large and distended with blood. No Graafian follicles were seen. The outer two-thirds of the section consisted of mature fibrous tissue with some round-cell infiltration in areas. The inner third has the general appearance of very vascular granulation-tissue with areas of hemorrhage. It contains very numerous distended vessels. There are many hemorrhagic areas, in some the blood-cells being well preserved, in others being replaced largely by *débris* and pigment. Throughout this layer is an abundant small-cell infiltration.

In a few places are seen large uninuclear polygonal cells, some of them appearing uniformly pale yellow, with faintly staining nuclei.

CASE III.—Mrs. C., aged fifty-three years, still menstruating, has complained of pain in her left iliac region since 1889. A satisfactory history of this case of ovarian abscess could not be obtained. At the time of her operation she was experiencing menstrual irregularities in the way of menorrhagias. Has not been pregnant for twenty-six years. Never had any pulmonary disease.

Examination revealed an immobile uterus and a mass in the left iliac region, tender and fixed, pushing the uterus over into the right side of the pelvis.

Operation, May 22, 1895. Upon opening the abdomen the left ovary containing an abscess was removed. A subperitoneal pedunculated fibroid as large as an English hickory-nut was removed from between the folds of the right broad ligament. Two hysterorrhaphy-stitches were used and the patient put to bed in good condition.

Her recovery was entirely satisfactory, and she left the hospital in four weeks.

Examination of the specimen. There were abundant general torn adhesions over the surface of the ovary and the tube. The tube was connected to the ovary by bands of adhesions, but was not intimately attached to it. Its abdominal end was patent, the tube was not dilated, contained no pus, and presented only signs of chronic catarrh. No connection between the lumen of the tube and the abscess-cavity could be made out. In the ovary was a single abscess one inch in diameter, containing two or three drachms of thick, yellow, very viscid pus. The abscess was surrounded by a wall one-fourth of an inch thick on all sides, externally being dense and fibrous, and internally presenting a lining of soft, friable material. The opposite tube and ovary were normal.

Bacteriological examination. Cover-slip preparations from the pus stained with aniline water gentian-violet solution showed abundant lance-shaped cocci arranged in single pairs or short chains. Preparations treated by Welch's method showed them to be surrounded by fairly well-developed capsules. They were stained by Gram's method. No other bacteria were found.

Cultures from the pus on neutral glycerin agar-agar remained sterile. Those made on Löffler's blood-serum mixture after twenty-four hours at 37° C. gave a delicate white growth, which proved to be a pure culture of cocci arranged in single pairs or short chains, staining by Gram's method. There were no capsules in the cultures. No growth occurred at room-temperature. No animal inoculations were made.

Sections of the abscess-wall, hardened in alcohol and stained by Gram's method, revealed abundant diplococci, mostly in single pairs or short chains, near the inner surface, and only a few deeper in the sections. Sections stained with hæmatoxylin and eosin were as follows: The outer two-thirds of the section were made up of irregularly arranged fibrous tissue. No Graafian follicles were seen. The inner third showed very dense infiltration with multinuclear leucocytes, with areas of marked nuclear fragmentation and some of entire necrosis. The vessels were few and not prominent, and there were no areas of hemorrhage. In the inner portion of the section were larger, unicellular polygonal cells, either single or in groups.

REMARKS. Two conditions are marked in these three cases. The first is the severe inflammatory invasion of the peritoneum as shown by the abundant adhesions. The second is in the macroscopic character of the pus, which was thick and very tenacious, resembling that seen in cases of empyema following lobar pneumonia caused by the *micrococcus lanceolatus*.

In each case the pus was literally loaded with cocci, while the sections of the abscess-walls showed only a very few. The large polygonal cells seen in the sections correspond to those represented in the drawings by Langer,⁸ and considered by him as "luteal" cells.

Zweifel,¹⁷ Frommel,¹⁵ and Witte¹⁶ report bacteriological examinations of 376 cases of pyosalpinx. In all of this large number of cases there were only seven instances where the *micrococcus lanceolatus* was found. In these cases there were abdominal pains, fever with chills, and nausea. In only one case (Frommel⁵) was there antecedent lung-affection, which was probably tubercular. In five of these cases the coccus existed in pure cultures, and in two it was associated with the staphylococcus and different bacilli. In all of them there were recent and old adhesions binding the tube to adjacent structures. The anamnesis is like that of puerperal sepsis and gonorrhœal salpingitis.

Martin³ suggests a possible diagnosis of pelvic abscess from the *micrococcus lanceolatus* by excluding, in the antecedent history, labor at term or interrupted, and gonorrhœal infection, and by the evident presence of severe perimetritis. It may be added also that he cautions particularly against infecting the peritoneum and abdominal wall with such pus during the operation, because of two fatal cases reported by Frommel and Witte.

Two additional points of interest in this form of abscess arrest our attention, viz., first, the route by which the pneumococcus reached the ovary; and, second, the point of structure of the ovary, which is its primary localization. The solution of these two questions is uncertain, because they may differ in different cases.

First, the route of invasion may be by (a) the external genital passages; (b) the intestines; (c) the general circulation.

a. Weickselbaum¹⁴ has observed the pneumococcus as a cause of endometritis and salpingitis. It is found in the diseased human vagina, never in the normal vagina, because it is not possible for pathogenic bacteria to exist in a normal acid vaginal secretion (Döderlein⁴). Thus it will be seen that in the condition of the vagina altered by local disease-processes the pneumococcus can reach the ovary from this tract by traversing the uterus and Fallopian tubes.

Poirier¹¹ has shown that the lymphatic vessels of the uterus connect with those of the tube and ovary near the ovary, thus supplying a possible route to the ovary along which infection can pass from the vagina.

b. Tubercular invasion of the tubes has been observed in women with intestinal tuberculosis (Jans⁷). Similarly, the pneumococcus which is almost constantly found in the human intestine (Stoecklin¹⁸) may escape from the intestine, where lesions of its mucous membrane exist, and gravitate to the pelvis, and thus reach the ovary. Illustrative of this point, Pinner¹⁰ introduced dust into the peritoneal cavity of dogs and rabbits, and it soon made its appearance in the tubes, uterus, and vagina. Reaching the pelvis in this manner, at the time of the rupture of a Graafian follicle, it could easily find a favorable localization in the cortex of the ovary. Confirmatory of this fact, that the pneumococcus invades the peritoneal cavity from the intestines, Barbacci¹ states that he found the *micrococcus lanceolatus* in 60 per cent. of cases of perforative peritonitis, and Wilson¹⁵ found it in the exudate of appendicitis. Grawitz⁶ has shown experimentally that a considerable number of pyogenic bacteria may be introduced into the peritoneal cavity without causing peritonitis, provided the peritoneum be healthy and the wound not infected. Therefore, it can be seen that it is possible for the pneumococcus escaping from the intestine into a healthy peritoneal cavity to gravitate to the pelvis and infect an ovary presenting a suitable point of invasion, like a ruptured Graafian follicle, as the seat of primary invasion of the pyogenic bacterium, because the resultant abscess-wall contained large luteal cells and because it was lined with a yellowish, crumbling, necrotic mass of tissue. Indeed, Corvill³ and Terillon have described pus-accumulations of considerable size in Graafian follicles. Reinstein¹² and Coe² believe that ovarian abscesses may begin as an infection of Graafian follicles.

c. The route of invasion by the circulation. Transmission of the germs of disease by this means is a well-known fact. By it any organ or tissue can be invaded. Capillary infarcts occur at any point in the capillary system, and when the circumstances are favorable the development of this secondary infection progresses in accordance with the natural history of the germs contained in the thrombic mass. An ovarian abscess, developing from this cause, will naturally be expected to have its seat in the parenchyma, and not in the cortex of the organ. Therefore, the structure of the abscess-wall would be likely to determine whether an ovarian abscess arose from the Graafian follicle, which is seated partially within the cortex of the ovary, or from the parenchyma of this organ. If the point of infection was a Graafian follicle, the pyogenic wall would contain cells characteristic of that follicle, *i. e.*, luteal cells. If it arose from the parenchyma, there would be an absence of such cells.

In these three abscesses we find the abscess-walls containing these peculiar bodies in the second and third cases, but not in the first one. If, therefore, the premises be correct concerning the histological ele-

ments of the abscess-wall in these cases, the deduction that the first case of infection of the ovary must have been through the general circulation, and that of the second and third cases through ruptured Graafian follicles, would seem to be tenable.

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